

NATIONAL PLANS FOR AIRCRAFT ICING AND IMPROVED AIRCRAFT ICING FORECASTS AND ASSOCIATED WARNING SERVICES

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Icing has long been recognized as a hazard to aircraft operations. Research on aircraft icing was extensive in the late 40's and early 50's. The advent of turbojet aircraft removed some of the urgency in the investigation of aircraft icing. As a result, research in this area was curtailed.

Recently, new aircraft designs, the emphasis on more fuel efficient operation, the use of composite materials, increased commuter aircraft use and increased rotorcraft use have combined to place greater demands on the government and private industry. Users demand greater flexibility in aircraft use both in civilian and military operations. This includes the use of aircraft in limited icing conditions, better resolution forecasts (spatially and temporally), and the use of rotorcraft in icing environments.

Recently, the United States' leadership in aviation was challenged when the French Puma and SuperPuma helicopters were certified by the FAA for operations in icing conditions. World-wide use of U. S. aircraft requires the understanding of icing environments world-wide and identification of all icing conditions. Current U. S. approval for aircraft operation in icing environments is limited to supercooled clouds and definition of the icing environment is based solely on data collected in the United States.

Recently, the United States has increased its activities related to aircraft icing in numerous fields: ice phobics, revised characterization of icing conditions, instrument development/evaluation, de-ice/anti-ice devices, simulated supercooled clouds, computer simulation and flight tests. These activities are carried out by several agencies. Obviously missing in the list of activities are those related to forecasting.

The Office of the Federal Coordinator for Meteorology is currently involved in two efforts currently under way to improve U. S. activities related to aircraft icing: one by the National Aircraft Icing Program Council (and its working group), and the second by the Committee for Aviation Services. The first effort is developing a National Plan on Aircraft Icing, and the second, in developing a plan for Improved Aircraft Icing Forecasts and Associated Warning Services.

The plan on forecast improvement started first and is being integrated into the National Plan. For this reason, the contents of the plans will be consistent and have similar organization. Each plan addresses: needs, current activities, projected activities, gaps, new initiatives, resources and schedule. The intent of the plans is to increase coordination of activities, avoid unnecessary duplication, provide a road map for future activities, and provide milestones for developments.

The National Plan seeks to define activities in the following major areas:

- Standard terminology and definitions related to aircraft icing emphasizing quantification
- Complete characterization of atmospheric icing environments
- Improvements in simulation of in-flight aircraft icing conditions
- Improved computer simulation of aircraft icing
- Evaluation of effects of approval for aircraft operation in limited icing conditions
- Reduced costs for qualification and certification
- Accurate, reliable, low-cost instrumentation for icing indications onboard aircraft
- Detailed forecasts of aircraft icing hazards

The last of these areas is further expanded in the Forecast Plan to include the following areas:

- Quantified forecasts related to aircraft icing
- Forecasts of meteorological values (e.g., Liquid Water Content, temperature)
- Relation of meteorological values to icing hazard (per aircraft)
- Required instrumentation to generate accurate forecasts
- Education of users on new methods, their significance, use and accuracy
- Dissemination of data for forecasts and of forecasts to users

The first step recommended is to validate the current forecast procedures to provide a starting point for future developments. This validation would include the definition of all current forecast procedures, a well documented data set to substantiate the quantitative assessment of current procedures (also useful for evaluation of future developments) and characterization of accuracy and errors.

Efforts on the two plans are finalizing the drafts of the reports in preparation for the publication of the reports.

These two plans will provide an approved structure for future U. S. activities related to aircraft icing. The recommended activities will significantly improve the position of government agencies to perform mandated activities and to enable U. S. manufacturers to be competitive in the world market, both in cost and capabilities. This should assure continued safe operation of the U. S. airspace, expanded operation of aircraft, and aircraft which lead the world in safe and economic operation in icing environments.